

## Reliability of Quick Viability Test with Tetrazolium Bromide on Cotton Seed

by

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**Introduction:** The need for rapid and reliable methods of testing cotton seed is greatly felt by workers engaged in multiplication and procurement of cotton seeds. The conventional methods of testing for germinability delays and hinders speedy decisions regarding procurement and distribution of cotton seed. Testing with tetrazolium bromide is claimed to be a quick method for estimating the viability of seed. An experiment was conducted to assess the reliability of the chemical means for testing the viability of cotton seeds in comparison with conventional methods.

**Previous Work:** Quick viability tests on a variety of crop seeds by chemical means received attention of several workers since nineteenth century (Dimitriewicz, 1876; Loew Bokorny, 1882; Lésage, 1922; Sakata, 1933; Hasegawa, 1936; Kuhn and Jerchel 1941; Cottrel, 1947; Porter *et al*, 1947; Mattson *et al*, 1947; Dufrenoy and Pratt, 1948; Shuel, 1948; and Hyde, 1949). They used chemicals like sulphuric acid, alkaline silver nitrate, potassium hydroxide, selenium and tellurium compounds and tetrazolium salts. Flemion (1948) found that a quicker assessment of viability was possible by germinating excised embryos on moist blotting paper at room temperature. Narayanan and Lakshmanan (1952) tested tetrazolium salts on a collection of crop seed and established their utility for expeditious determination of viability compared to indigent methods. However, they were of opinion that the potentialities of tetrazolium salt as a reagent are sufficiently promising to deserve detailed investigation.

**Material and Methods:** Based on the findings in India and abroad for assessing viability of seeds by chemical means, experiments were undertaken at Cotton Breeding Station, Coimbatore on M. C. U. 3 (*G. hirsutum*) and K. 6 (*G. arboreum*) cotton seeds with a view to assess the reliability of the chemical salt compared to the standard methods.

The experiment included the following six treatments:

1. Soaking decoated seeds in tetrazolium bromide (1%) solution: Good seeds soaked in water for 16 hours were decoated by hand without injuring the cotyledons and embryos and they afterwards were soaked in tetrazolium bromide (1%) solution for three hours until a good intense stain had developed.

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2. Sowing in sand medium seeds decoated as above.
3. Sowing fuzzy seeds in sand medium.
4. Sowing fuzzy seeds in sand medium after soaking in water for sixteen hours.
5. Placing excised embryos on moist blotting paper. Fuzzy seeds after soaking in water for sixteen hours were excised as described by Flemion (1948). The excised embryos were kept on moist blotting paper.
6. Testing fuzzy seeds in gunny medium: Seeds were tied in a small moist gunny bag.

The six treatments were randomised and replicated four times. One hundred seeds were tested under each treatment and replication. In treatments involving sand, gunny and blotting paper, the medium concerned was kept sufficiently moist to facilitate easy absorption of moisture and initiate germination process. In the treatment with tetrazolium bromide, the solution was drained and the seeds were washed with water. The stained seeds were grouped into different grades, as specified by James *et al* (1962) indicating their viability. In other treatments germination counts were recorded every day from third day onwards after sowing.

The transformed values of germination counts were worked out and analysed statistically.

**Results** The germination counts, the number of days taken for completion of germination and the statistical interpretation of the data are furnished in Table I.

TABLE I  
Mean values of germination

S. No.	Treatments	Days taken to complete germination	Mean germination per cent		Mean S. E. 1.9 C. D. 5.8 (P=0.05) for treatments
			M.C.U. 3 <i>G. hirsutum</i>	K. 6 <i>G. arboreum</i>	
1.	Tetrazolium bromide (1%) solution with decoated seeds	1	78.4	71.0	74.7
2.	Fuzzy seeds in sand medium	9	69.9	62.0	66.0
3.	Decoated seeds in sand medium	8	63.9	63.2	63.6
4.	Soaked fuzzy seeds in sand medium	8	65.2	57.9	61.6
5.	Excised embryo in blotting paper	3	71.0	63.5	67.3
6.	Fuzzy seeds in gunny medium	4	68.4	64.5	66.5
	Mean		69.5	63.7	66.6
	Significance for varieties		Significant		
	S. E.	1.1			
	C. D.	3.1			
	(P=0.05)				

The main effects for varieties as well as treatments were significant at one per cent level; but the interaction was not significant indicating lack of differential response of varieties to the different methods of germination tests. Among the six treatments under comparison, tetrazolium bromide recorded significantly higher germination percentage than rest of the treatments. Treatments other than tetrazolium bromide were statistically on par with each other.

**Discussion:** The chemical tetrazolium bromide was not only the quickest means of testing the viability of cotton seeds but also it gave significantly higher values. Since the chemical did not involve actual germination the role of extraneous factors harmful to germinable seeds in ordinary methods was not excluded though the test was completed in a day compared to other methods. Amir Singh (1965) from his studies on purity and germination of cotton seed samples has reported the superiority of sand medium method. In the present study, all the methods except the chemical means were on par and they were in close agreement when compared with the percentage of embryos found viable by observing the behaviour of excised embryos. While testing the heterogeneity of the treatments in comparison with tetrazolium *versus* rest, the chemical method was highly significant giving higher values than others. Flemion and Poole (1948) observed large and frequent deviation in many of the individual tests with tetrazolium salt as compared with actual germination while many workers, mostly on cereals, recorded close agreements between staining tests and actual germination (Shuel; 1928; Kuhn and Jerceel, 1941; Cottrell, 1947 and Porter *et al* 1948). From the available data, it thus appears that the reliability of the chemical tetrazolium bromide for assessing viability of cotton seed is doubtful and needs fuller investigation for practical purpose. The standard methods like sand and gunny media, though the results are delayed by days, appear to be the best with regard to cotton seeds as the results vary only within reliable range.

**Summary:** An experiment was conducted to adjudge the reliability of tetrazolium bromide as a means for testing the viability of cotton seed in comparison with conventional methods. The study revealed that though the tetrazolium bromide is the quickest and easiest of all the methods it gives significantly higher values and therefore, the sand and gunny media are the best for cotton seeds as the results from them are within reliable range.

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